

Final Presentation

Unified Software Team

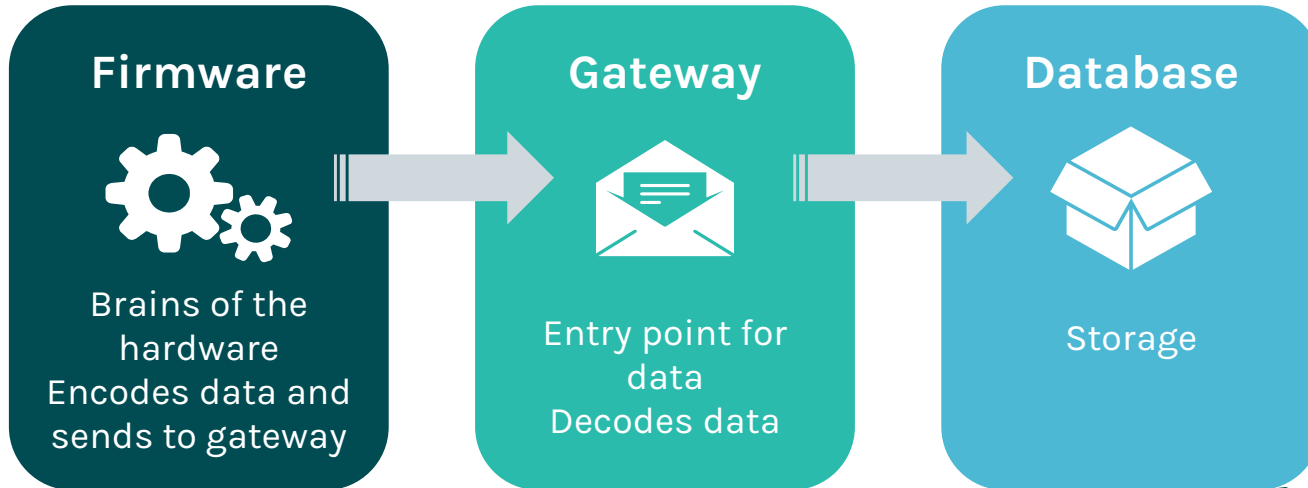
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Overview

- Project Overview
 - Motivation
 - Overall Project Goals
 - Overall Block Diagram
 - Firmware
 - Gateway
 - Database
- Overall Design
Final Status
Problems/Issues
Future Improvements

Project Overview

- Create and design a system in which sensor data is collected, transmitted, received, and stored.



Motivation

- Have the tools and background to make changes to the system
- Ensure that past and current work can be passed down to future members
- Contribute to renewable energy initiatives
 - Reliable, accurate and low-cost sensor modules

Goals

- Improve understanding of existing software system
- Improve system to gather, transmit and store weatherbox data
- Incorporate version control and code reviews into workflow
- Communicate with other teams
- Improve documentation

Functional Overall Block Diagram



2.

Firmware

Firmware Design Block Diagram



Firmware Functional Block Diagram



Goals

- Improve modularity of firmware code
- Create new sensor drivers
- Develop deployable versions of weatherbox firmware
- Improve power efficiency of weatherboxes

Firmware Algorithms

Initialization

- Create and initialize board struct and run Power On Self-Test

Execution

Heartbeat Packets

- Sample Diagnostic data, then construct and send packets

Data Packets

- Sample Sensor data, then construct and send packets

Command Mode

- Interrupt execution, perform task based on user input

Firmware - Problems and Solutions

- Understanding the existing firmware
 - Datasheets and documentation
- Confirming accurate data readings from sensors

Firmware - Problems and Solutions

- Apple
 - GPS Library memory heavy
 - SRAM memory filled
- Cranberry
 - Confirming accurate data readings from sensor
 - Ensuring proper transmission of packets
 - Temperature data type overflow
- Dragonfruit
 - Inconsistent packet transmission
 - Inconsistent documentation (ADC module)

Firmware - Final Status

- Apple
 - Successful deployment
 - Implemented GPS Library
 - Rewrote XBee Library
- Cranberry
 - Successful deployment until heavy weather damaged box
 - Exploring Low Power Mode
 - Working on GPS device driver
- Dragonfruit
 - Successful deployment until heavy weather damaged box
 - Developing Low Power Mode
 - Working on GPS device driver

Firmware - Future Improvements

- Communicate with weatherbox hardware teams to prepare device drivers for next versions of weatherboxes
- Create detailed documentation and user manual
- Increase sampling period to 1 minute
- Reduce the power consumption
- GPS and Real-Time Clock Integration



3. Gateway

Gateway - Goals

- Successfully retrieve data packets sent by weatherbox devices
 - All weatherbox generations
- Accurately decode data packets
- Store collected data into a database
- Implement system for testing Gateway functionality

Gateway Block Diagram



Gateway Pseudocode

while no packets to process:

 wait for packets

extract rf data from packet

determine schema number

If schema is 0

 decode as heartbeat packet

else if schema is 1

 decode as apple packet

else if schema is 2

 decode as cranberry packet

else if schema is 3

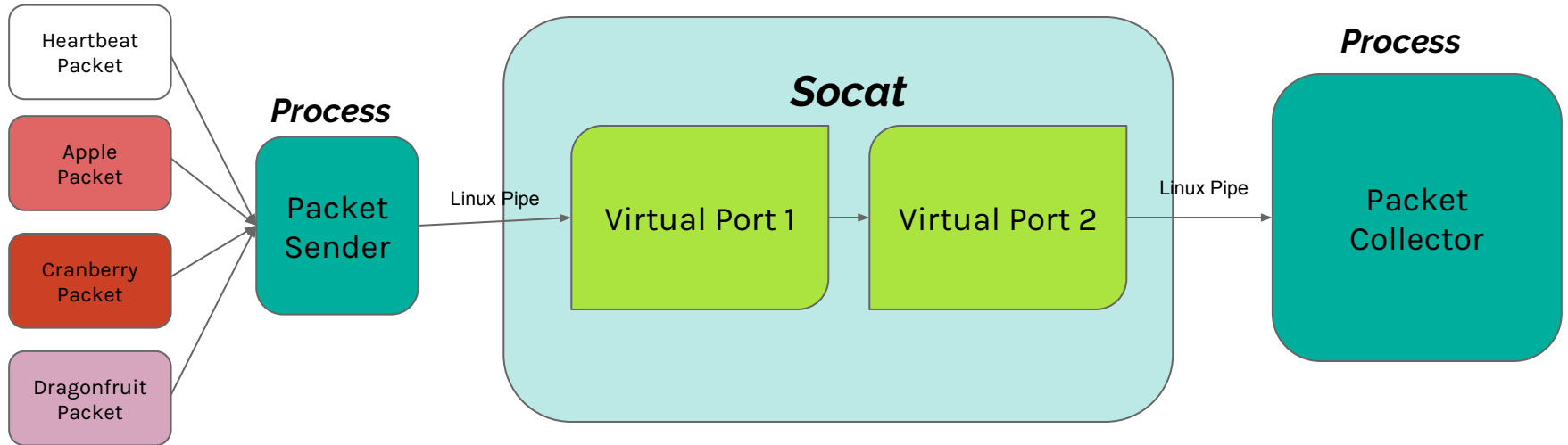
 decode as dragonfruit packet

Print data to stdout

Add data to respective .csv file

Write data to respective database table

Simulation Process Diagram



Gateway - Current Status

- Collects and decodes all packet types
 - Heartbeat, Apple, Cranberry, Dragonfruit
- Data output
 - Console
 - .csv File
 - Database
- Simulation with pseudo packets

Gateway - Problems & Solutions

- Gateway process crashing constantly
 - Attempted hardware fixes
 - Modified Gateway to monitor status
 - Threading.py
 - Re-initialize Gateway if bad status detected

Gateway - Future Improvements

- Work with Firmware to incorporate latest packet changes
 - GPS, RTC, etc.
- Implement data transfer with socket connections
 - Remove need for storing in memory
- Improve pseudo packet collection process

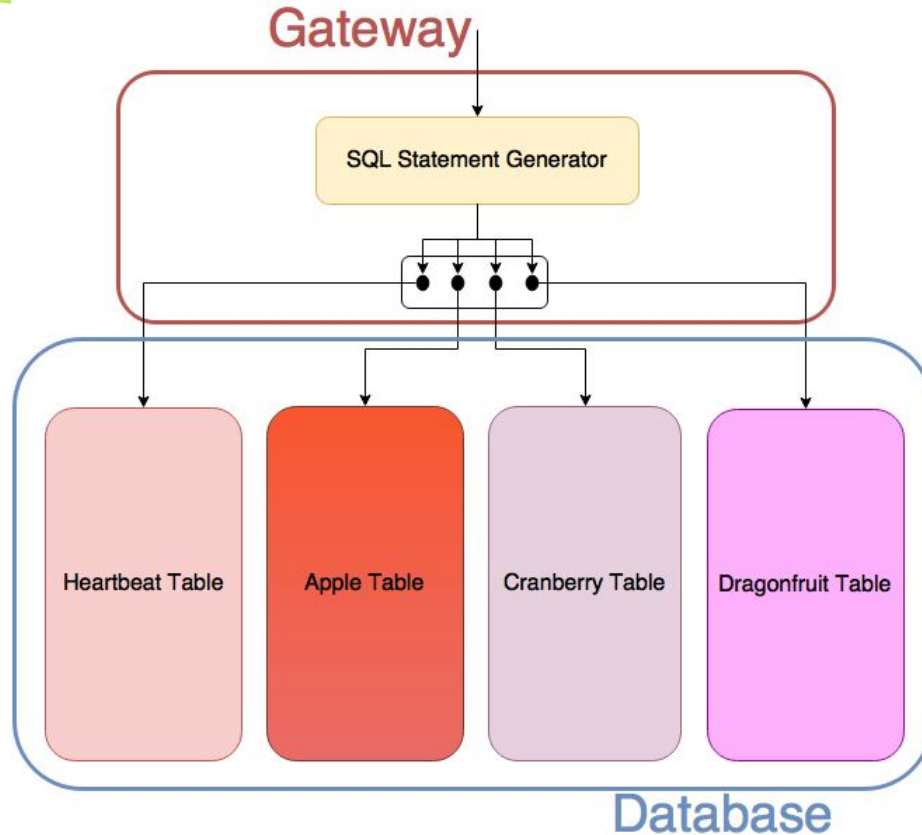


4. Database

Database - Goals

- Create a database to store weatherbox data
 - Each generation stored in unique table
- Provide a way for lab members to access data

Database Block Diagram



Database - Current Status

- Initialized database on computer in lab
 - Receiving and storing data from gateway
- Multiple tables for each generation and heartbeat
- Script to format data for forecasting team

Database - Issues and Problems

- Focusing on other aspects of the software system first
 - Limited time

Database - Future

- Modify existing tables or add new tables when needed
- Implementing Indexes in the database
- Integration of methods to access data
 - Dashboard App

Gantt Chart

Week	1	2	3	4	5	6	7	8	9	10	11	12	13
Date	9/10/2016	9/17/2016	9/24/2016	10/1/2016	10/8/2016	10/15/2016	10/22/2016	10/29/2016	11/5/2016	11/12/2016	11/19/2016	11/26/2016	12/3/2016
Presentations													
Proposal													
Design Review													
Critical Design Review													
Demonstration/Final Presentation													
Research													
Firmware													
Gateway													
Database													
Firmware													
Initial Apple Deployment Firmware													
Initial Cranberry Deployment Firmware													
Initial Dragonfruit Deployment Firmware													
Apple GPS													
Dragonfruit GPS													
Reduction of Power Consumption													
Documentation for All Generations													
Gateway													
Packet Decoder w/ Test													
Fake Packets													
Script Reset													
Parse Time													
Database													
Initialize Basic Database													
Test Writing to Database													



Questions



